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10 CFR 50.73

Serial: RNP-RA/17-0008

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United States Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2  
DOCKET NO. 50-261/RENEWED LICENSE NO. DPR-23

LICENSEE EVENT REPORT NO. 2016-005-01:  
REACTOR TRIP AND AUTOMATIC SYSTEM ACTUATION DUE TO WEATHER-RELATED GRID  
DISTURBANCE

Ladies and Gentlemen:

Pursuant to 10 CFR 50.73, Duke Energy is submitting the attached Licensee Event Report revision. The revision provides corrected and updated information related to the event. Please direct any questions regarding this matter to Mr. Tony Pilo, Manager – Nuclear Regulatory Affairs at (843) 857-1409.

This document contains no new regulatory commitments.

Sincerely,

Ernest J. Kapopoulos, Jr.  
Site Vice President

EJK/jmw

Attachment

c: Region Administrator, NRC, Region II  
NRC Resident Inspector, HBRSEP  
D. Galvin, NRR

United States Nuclear Regulatory Commission  
Attachment to Serial: RNP-RA/17-0008  
4 Pages (including this page)

**H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2**

**REACTOR TRIP AND AUTOMATIC SYSTEM ACTUATION DUE TO WEATHER-  
RELATED GRID DISTURBANCE**



## LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

## 1. FACILITY NAME

H. B. Robinson Steam Electric Plant, Unit No. 2

## 2. DOCKET NUMBER

05000 261

## 3. PAGE

1 OF 3

## 4. TITLE

Reactor Trip and Automatic System Actuation Due to Weather-Related Grid Disturbance

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	08	2016	2016	- 005	- 01	02	22	2017	FACILITY NAME	DOCKET NUMBER
										05000
										05000
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
10. POWER LEVEL			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)		
			<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 73.77(a)(2)(i)		
			<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A			

## 12. LICENSEE CONTACT FOR THIS LER

## LICENSEE CONTACT

Tony Pilo, Manager, Nuclear Regulatory Affairs

## TELEPHONE NUMBER (Include Area Code)

(843) 857-1409

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	FK	RLY	G080	Y	X	JE	RLY	T351	Y

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 1302 hours Eastern Daylight Time (EDT) on 10/08/2016 with the plant in Mode 1 at 100 percent power, H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP2), experienced a grid perturbation. As a result, HBRSEP2 experienced a reactor trip due to low voltage on the 4kV buses. Plant safety systems responded with the emergency buses separating from offsite power due to emergency bus undervoltage. The emergency diesel generators (EDG) started and powered the 480V emergency buses. 'A' service water pump did not start on the blackout sequencer; however, sufficient service water flow was available from the three operating service water pumps. This failure did not aggravate this event. The site declared an Unusual Event (UE) at 1317 EDT for loss of power to emergency buses. At 0011 EDT on 10/09/16, the UE was terminated.

Once the power grid was stable, plant personnel commenced restoration of offsite power to allow shutdown of the the EDGs. During this evolution, at approximately 2323 EDT on 10/08/2016, an automatic actuation of the 'B' auxiliary feedwater (AFW) pump occurred due to improper breaker coordination that satisfied the autostart logic for the AFW system.

The apparent cause of the voltage transient in the HBRSEP2 switchyard is a failed fault detection relay, which prevented the grid fault from being immediately isolated. The failed relay has been replaced.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
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1. FACILITY NAME		2. DOCKET NUMBER		3. LER NUMBER		
H. B. Robinson Steam Electric Plant, Unit No. 2		05000-	261	YEAR 2016	SEQUENTIAL NUMBER 005	REV NO. 01

**NARRATIVE****BACKGROUND**

At the time this condition was identified, H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP2) was operating in Mode 1 at approximately 100 percent power. No structures, systems or components were out of service at the time of the event that contributed to this event.

HBRSEP2 is connected to the transmission grid via six 230kV lines leaving the 230kV switchyard[FK]. The transmission line initiating this event is the Rockingham 230kV line.

This event is reportable under 10 CFR 50.73(a)(2)(iv)(A), any event or condition that resulted in valid manual or automatic actuation of any of the following systems: reactor protection system[JC], general containment isolation signals[BD], emergency core cooling systems[BQ], auxiliary or emergency feedwater system[BA], containment heat removal and depressurization systems[BE], emergency AC electrical systems[EK], emergency service water systems[B1].

On 10/08/2016, notification to the NRC Operations Center was made (EN# 52290) under 10 CFR 50.72(b)(2)(iv)(B) due to automatic actuation of several safety systems, and under 10 CFR 50.72(b)(3)(iv)(A) due to the valid subsequent actuation of the auxiliary feedwater system.

**EVENT DESCRIPTION**

At 1302 hrs on 10/08/16, a severe voltage depression in the HBRSEP2 switchyard was caused by a fault on the Robinson-Rockingham 230kV transmission line that was not immediately isolated due to a failed fault detector (50L) relay[RLY] in the HBRSEP2 switchyard. Failure of the 50L relay prevented the transmission of a trip signal to the Rockingham 230kV line circuit breakers[BKR] in the HBRSEP2 switchyard. The reduced voltage was then transferred to all of the HBRSEP2 auxiliary electrical buses[BU], including the 4kV buses. The reactor[RCT] tripped when a two out of three coincidence was satisfied for the 4kV bus undervoltage relays. The undervoltage caused the actuation of several safety systems, including the reactor protection system (RPS), emergency diesel generators (EDGs), emergency service water system, and the auxiliary feedwater system (AFW). These systems functioned as designed, with the exception of the 'A' service water pump[P], which did not start on the blackout sequencer due to high contact resistance within the sequencer relay[44]. However, sufficient service water flow was available from the three operating service water pumps. The 'A' service water pump failure did not aggravate this event, and the failed sequencer relay was replaced.

After grid stability was achieved, plant operations personnel commenced restoration of offsite power to the emergency buses to allow the shutdown of the EDGs. At approximately 2323 on 10/8/2016, an inadvertent valid actuation of the 'B' motor-driven AFW pump occurred when the 'B' EDG output breaker was opened as part of restoring offsite power to the emergency bus. This actuation initiated due to the presence of an actuation signal that was no longer being defeated with the 'B' EDG output breaker closed.

**CAUSAL FACTORS**

The 10/08/2016 grid fault on the Robinson-Rockingham 230kV line was isolated immediately at Rockingham but not at HBRSEP2. The undervoltage transient was allowed to propagate to the HBRSEP2 switchyard due to a failed 50L fault detection relay. This caused a decreased voltage below the HBRSEP switchyard undervoltage relay setpoints.



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**NARRATIVE****CAUSAL FACTORS (continued)**

The AFW system actuation during restoration of offsite power to the emergency buses was due to inadequate procedural guidance to direct an infrequently performed task: offsite power restoration to vital buses post loss of offsite power (LOOP) event, post outage or emergency operating procedure entry. Interviews with the operations crew revealed that the operators were in "knowledge space" due to a lack of procedural guidance regarding the AFW circuitry during restoration of power following a LOOP event. Though the operators understood the interlock[IEL] with the AFW pump autostart, it was not considered during the restoration process. The operators' focus was on ensuring power was restored to the emergency bus to ensure no errors occurred, which could result in an escalation to an ALERT condition.

**CORRECTIVE ACTIONS**

Complete:

1. Bypass the failed 50L Relay.
2. Replace failed 50L relay (Work Order 20119476)
3. Replaced failed 'A' Service Water pump relay (Work Order 20115561)

Planned:

1. Revise procedure OP-603, Electrical Distribution, to address shortcomings related to the AFW autostart during restoration of offsite power to emergency buses.

**SAFETY ANALYSIS**

The HBRSEP2 reactor trip due to 4kV bus undervoltage and resultant plant safety system actuations due to undervoltage on the 480V buses occurred automatically per system design. The failure of the 50L fault detector relay on the Robinson-Rockingham 230kV line in the Robinson switchyard was self-revealing. The 50L relay is not a safety-related relay, but its failure resulted in the reactor/plant trip. There was no nuclear safety significance beyond a plant trip and related system actuations. There were no industrial or radiological safety impacts.

HBRSEP2 experienced a reduced switchyard voltage to less than 50% nominal voltage. The HBRSEP2 start-up transformer[XFMR] never disconnected from the switchyard and remained energized throughout the event. The HBRSEP2 4kV buses remained energized throughout the event. The HBRSEP2 480V buses tripped on undervoltage, except for 480V bus 5, with the emergency buses and the dedicated shutdown bus being re-energized from diesel generators[DG], per electrical system design.

The automatic actuation of the AFW system during restoration of offsite power was valid, and the system responded to plant conditions as designed. There is no safety consequence to this aspect of the event. The cause was related to inadequate procedural guidance and not attributed to any equipment failures. This event resulted in no significant impact to the health and safety of the public.

**ADDITIONAL INFORMATION**

An operating experience (OE) search was conducted; there is no prior OE at HBRSEP2 involving failure of a fault detection relay in the HBRSEP2 switchyard within the past three years.

Energy Industry Identification System (EIIIS) codes for systems and components relevant to this event are identified in the text of this document within brackets [ ].